To: James Cashwell
From: Chris Ricardi
Date: March 14, 2013
Subject: 51 Eames Street Property Slurry Wall Quarterly Monitoring Program 4Q13 – November 2013 Surface Water and Sediment

DATA VALIDATION REPORT
NOVEMBER 2013 SLURRY WALL SURFACE WATER AND SEDIMENT
OLIN CHEMICAL SUPERFUND SITE
WILMINGTON, MASSACHUSETTS

TestAmerica Laboratories Data Sets: 480-50672-1 and 480-50673-1

1.0 INTRODUCTION

Surface water and sediment samples were collected from the Olin Chemical Superfund Site on November 21, 2013. Samples were analyzed by TestAmerica Laboratories Inc. in Buffalo, New York. Data were reported in sample delivery groups (SDGs) 480-50672-1 and 480-50673-1. A summary of samples included in this review is contained in Table 1. Samples reviewed in this report were analyzed for the following USEPA SW-846 (USEPA, 1996), USEPA wastewater (USEPA, 1993), or Standard Methods (APHA, 1995):

- Metals (aluminum, chromium and iron) by USEPA Method 6010B in sediment
- Dissolved and Total Metals (aluminum, chromium, and sodium) by USEPA Method 6010B in surface water
- General chemistry analyses for ammonia by USEPA Method 350.1; chloride and sulfate by USEPA Method 300.0; nitrate and nitrite by USEPA 353.2; and specific conductance by SM 2510B

The Final Interim Response Steps Work Plan (MACTEC, 2007) and the MassDEP Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP) [MassDEP, 2010] were used as references during the review. Analytical packages were reviewed using the Level 1 Data Quality Evaluation checklists that were developed for the Olin Wilmington monitoring tasks. Final sample results are presented on data summaries in Table 2. A summary of validation qualification actions is presented on Table 3. Validation reason codes are associated with final results that have been qualified as indicated in Table 3.

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Chelmsford, Massachusetts 01824 USA
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2.0 METALS

2.1 Surface Water

Data were reviewed for the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Laboratory Control Sample / Laboratory Control Sample Duplicate Analysis (LCS/LCSD)
* Field Duplcate
* Detection Limits
* Dissolved vs. Total Metals Comparison (surface water only)

* indicates that criteria were met for this parameter

Reporting Limits

The reporting limit for aluminum (200 µg/L) was above the project required limit of 100 µg/L.

2.2 Sediment

Data were reviewed for the following parameters:

* Data Completeness
* Holding Time
* Blanks
* Laboratory Control Sample / Laboratory Control Sample Duplicate Analysis Matrix Spike / Matrix Spike (MS/MSD) Duplicate
* Field Duplicate
* Detection Limits

* indicates that criteria were met for this parameter

Matrix Spike Analysis – Anions

MS/MSD were performed on groundwater sample OC-SD-SD1. The percent recoveries in the MS/MSD for aluminum (164/210) exceeded the control limit of 125. The aluminum results in sample OC-SD-SD1 and OC-SD-DUP were qualified estimated "J".

3.0 GENERAL CHEMISTRY – Ammonia, Chloride, Sulfate, Nitrate, Nitrite, and Specific Conductance

Data were reviewed for the following parameters:

* * Data Completeness
* * Holding Time
* * Blanks
  Matrix Spike Analysis
* * Laboratory Duplicate Analysis (specific conductance only)
* * Field Duplicate
* * Laboratory Control Sample / Laboratory Control Sample Duplicate Analysis
* * Detection Limits

* indicates that criteria were met for this parameter

Matrix Spike Analysis – Anions

MS/MSD were performed on surface water sample OC-PZ-18RSW. The percent recoveries in the MS/MSD for ammonia (136/139) exceeded the control limit of 125. The ammonia results in sample OC-PZ-18RSW and OC-PZ-18RSWDUP were qualified estimated "J".

Reporting Limits

The reporting limit for nitrite (0.05 µg/L) was above the QAPP specified limit of 0.01 µg/L.

Unless discussed above, sample results are interpreted to be usable as reported by TestAmerica.

Chris Ricardi, NRCC-EAC
Senior Chemist

1/17/14
Date

Michael Murphy

3/14/14
Date

Project Principal

References:

American Public Health Association (APHA), 1995. "Standard Methods for Examination of Water and Wastewater"; 19th Edition; APHA, 1015 Fifteenth St., NW. Washington, DC 20005.

MACTEC, 2007. "Final Interim Response Steps Work Plan"; Olin Chemical Superfund Site; 51 Eames Street, Wilmington, Massachusetts; August 8, 2007.

Massachusetts Department of Environmental Protection (MassDEP), 2010. "The Compendium of Quality Assurance and Quality Control Requirements and Performance Standards for Selected Analytical Methods Used in Support of Response Actions for the Massachusetts Contingency Plan (MCP)"; Bureau of Waste Site Cleanup; 1 Winter Street, Boston, Massachusetts 02108; WSC-CAM; July 2010.

U.S. Environmental Protection Agency (USEPA), 1993. "Methods for Chemical Analysis and Water and Wastes (MCAWW)", EPA/600/4-79-020 (March 1983) with updates and supplements EPA/600/4-91-010 (June 1991), EPA/600/R-92-129 (August 1992) and EPA/600/R-93-100 (August 1993).

U.S. Environmental Protection Agency (USEPA), 1996. "Test Methods for Evaluating Solid Waste"; Laboratory Manual Physical/Chemical Methods; Office of Solid Waste and Emergency Response; Washington, DC; SW-846; November 1986; Revision 4 - December 1996.

Table 1
Sample Summary
Data Validation Report
November 2013 Slurry Wall / Cap Groundwater, Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

Lab Sample ID	Location	Sample ID	Sample Date	SW846 6010B Total Metals	SW846 6010B Filtered Metals	E350.1 (QuickChem 10-107-06-1-B) Ammonia	A2510B Conductance	40CFR136A 300.0 Anions	E353.2 Nitrate/Nitrite	E160.3 Percent Solid
Surface Water										
480-50672-1	ISCO3	OC-ISCO3	11/21/2013	3	3	1	1	2	2	
480-50672-2	ISCO2	OC-ISCO2	11/21/2013	3	3	1	1	2	2	
480-50672-3	PZ-16RR	OC-PZ-16RRSW	11/21/2013	3	3	1	1	2	2	
480-50672-4	PZ-17RR	OC-PZ-17RRSW	11/21/2013	3	3	1	1	2	2	
480-50672-5	SD-17	OC-SD-17	11/21/2013	3	3	1	1	2	2	
480-50672-6	PZ-18R	OC-PZ-18RSW	11/21/2013	3	3	1	1	2	2	
480-50672-7	ISCO1	OC-ISCO1	11/21/2013	3	3	1	1	2	2	
480-50672-8	PZ-18R	OC-PZ-18RSWDUP	11/21/2013	3	3	1	1	2	2	
Sediment										
480-50673-1	SD-SD1	OC-SD-SD1	11/21/2013	3						2
480-50673-2	SD-SD2	OC-SD-SD2	11/21/2013	3						2
480-50673-3	SD-SD3	OC-SD-SD3	11/21/2013	3						2
480-50673-4	SD-SD4	OC-SD-SD4	11/21/2013	3						2
480-50673-5	SD-SD5	OC-SD-SD5	11/21/2013	3						2
480-50673-6	SD-SD1	OC-SD-DUP	11/21/2013	3						2

Notes:
Number listed under method indicates number of target analytes reported.

Prepared by / Date: KJC 12/11/13
Checked by / Date: MJW 01/14/14

Table 2
Final Results Summary
Data Validation Report
November 2013 Slurry Wall / Cap Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Loc Name	ISCO1		ISCO2		ISCO3		PZ-16RR		PZ-17RR		PZ-18R		PZ-18R		SD-17	
			Field Sample ID	OC-ISCO1		OC-ISCO2		OC-ISCO3		OC-PZ-16RRSW		OC-PZ-17RRSW		OC-PZ-18RSW		OC-PZ-18RSWDUP		OC-SD-17	
			Field Sample Date	11/21/13		11/21/13		11/21/13		11/21/13		11/21/13		11/21/13		11/21/13		11/21/13	
			QC Code	FS		FS		FS		FS		FS		FS		FD		FS	
			Lab Sample Delivery Group	480-50672-1		480-50672-1		480-50672-1		480-50672-1		480-50672-1		480-50672-1		480-50672-1		480-50672-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
T	SW6010	Aluminum	ug/l	120	J	1000		62	J	190	J	2900		140	J	100	J	6300	
T	SW6010	Chromium	ug/l	12		180		1.6	J	41		640		12		12		1300	
T	SW6010	Sodium	ug/l	64000		170000		86000		230000		250000		65000		63000		260000	
F	SW6010	Aluminum	ug/l	69	J	200	U	62	J	120	J	1700		66	J	200	U	2500	
F	SW6010	Chromium	ug/l	7.3		19		5	U	28		440		6.1		6.5		590	
F	SW6010	Sodium	ug/l	66000		180000		90000		230000		260000		66000		66000		260000	
T	E300	Chloride	mg/l	110		210		190		250		300		110		110		300	
T	E353.2	Nitrate as N	mg/l	0.16		1.1		0.78		0.87		0.71		0.16		0.17		0.63	
T	E353.2	Nitrite as N	mg/l	0.05	U	0.026	J	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U	0.05	U
T	E350.1	Nitrogen, as Ammonia	mg/l	20		71		0.27		120		140		18	J	19	J	130	
T	E300	Sulfate	mg/l	74		490		21		800		900		72		73		900	
T	A2510B	LAB SPECIFIC CONDUCTANCE	umhos/cm	600		1800		770		2600		2800		610		600		2800	

Notes:

T = total (unfiltered)

F = filtered

FS = field sample

FD = field duplicate

U = not detected, value is the detection limit

J = value is estimated

ug/l = microgram per liter

mg/l = milligram per liter

umhos/cm = micro reciprocal ohms per centimeter

Prepared by / Date: KJC 01/14/14

Checked by / Date: MJW 01/14/14

Table 2
Final Results Summary
Data Validation Report
November 2013 Slurry Wall / Cap Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

			Loc Name	SD-SD1		SD-SD1		SD-SD2		SD-SD3		SD-SD4		SD-SD5	
			Field Sample ID	OC-SD-DUP		OC-SD-SD1		OC-SD-SD2		OC-SD-SD3		OC-SD-SD4		OC-SD-SD5	
			Field Sample Date	11/21/13		11/21/13		11/21/13		11/21/13		11/21/13		11/21/13	
			QC Code	FD		FS		FS		FS		FS		FS	
			Lab Sample Delivery Group	480-50673-1		480-50673-1		480-50673-1		480-50673-1		480-50673-1		480-50673-1	
Frac	**Method**	**Analyte**	**Units**	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
T	SW6010	Aluminum	mg/kg	9600	J	9800	J	9700		11000		7300		8600	
T	SW6010	Chromium	mg/kg	18		24		94		29		15		99	
T	SW6010	Iron	mg/kg	11000		12000		12000		17000		9300		11000	
T	E160.3	Percent Moisture	percent	29		29		21		24		25		27	
T	E160.3	Percent Solids	percent	71		71		79		76		75		73	

Notes:

T = total (unfiltered)

FS = field sample

FD = field duplicate

J = value is estimated

mg/kg = milligram per kilogram

Prepared by / Date: KJC 01/14/14

Checked by / Date: MJW 01/14/14

Table 3
Validation Qualification Action Summary
Data Validation Report
November 2013 Slurry Wall / Cap Surface Water and Sediment
Olin Chemical Superfund Site
Wilmington, Massachusetts

SDG	Lab Sample ID	Analytical Method	Field Sample ID	Parameter	Lab Result	Lab Qualifier	Final Result	Final Qualifier	Val Reason Code	Units
480-50672-1	480-50672-6	E350.1	OC-PZ-18RSW	Nitrogen, as Ammonia	18		18	J	MS-H	mg/l
480-50672-1	480-50672-8	E350.1	OC-PZ-18RSWDUP	Nitrogen, as Ammonia	19		19	J	MS-H	mg/l
480-50673-1	480-50673-1	SW6010	OC-SD-SD1	Aluminum	9800		9800	J	MS-H	mg/kg
480-50673-1	480-50673-6	SW6010	OC-SD-DUP	Aluminum	9600		9600	J	MS-H	mg/kg

Units:

mg/l = milligram per liter

mg/kg = milligram per kilogram

Validation Reason Codes:

MS-H = MS and/or MSD recovery high

Prepared by / Date: KJC 01/14/14

Checked by / Date: MJW 01/14/14

Validation Qualifier:

J = value is estimated

Client Sample ID: OC-ISCO3

Date Collected: 11/21/13 13:00
Date Received: 11/22/13 01:30

Lab Sample ID: 480-50672-1
Matrix: Surface Water

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	1.6	J	5.0	1.0	ug/L		11/22/13 09:30	12/05/13 16:24	1
Aluminum	62	J	200	60	ug/L		11/22/13 09:30	12/05/13 16:24	1
Sodium	86000	B	1000	320	ug/L		11/22/13 09:30	12/05/13 16:24	1

Method: 6010 - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND		5.0	1.0	ug/L		11/22/13 09:30	12/01/13 01:18	1
Aluminum	62	J	200	60	ug/L		11/22/13 09:30	12/01/13 01:18	1
Sodium	90000		1000	320	ug/L		11/22/13 09:30	12/01/13 01:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	190		2.5	1.4	mg/L			11/25/13 22:16	5
Sulfate	21		2.0	0.35	mg/L			11/22/13 23:26	1
Ammonia	0.27		0.020	0.0090	mg/L			11/22/13 14:38	1
Nitrate as N	0.78		0.050	0.020	mg/L			11/22/13 07:22	1
Nitrite as N	ND		0.050	0.020	mg/L			11/22/13 07:22	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	770		1.0	1.0	umhos/cm			11/22/13 10:40	1

Client Sample ID: OC-ISCO2

Date Collected: 11/21/13 13:15
Date Received: 11/22/13 01:30

Lab Sample ID: 480-50672-2
Matrix: Surface Water

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	180		5.0	1.0	ug/L		11/22/13 09:30	12/05/13 16:27	1
Aluminum	1000		200	60	ug/L		11/22/13 09:30	12/05/13 16:27	1
Sodium	170000	B	1000	320	ug/L		11/22/13 09:30	12/05/13 16:27	1

Method: 6010 - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	19		5.0	1.0	ug/L		11/22/13 09:30	12/01/13 01:21	1
Aluminum	ND		200	60	ug/L		11/22/13 09:30	12/01/13 01:21	1
Sodium	180000		1000	320	ug/L		11/22/13 09:30	12/01/13 01:21	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	210		5.0	2.8	mg/L			11/25/13 22:26	10
Sulfate	490		20	3.5	mg/L			11/25/13 22:26	10
Ammonia	71		1.0	0.45	mg/L			11/22/13 14:39	50
Nitrate as N	1.1		0.050	0.020	mg/L			11/22/13 07:24	1
Nitrite as N	0.026	J	0.050	0.020	mg/L			11/22/13 07:24	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	1800		1.0	1.0	umhos/cm			11/22/13 10:40	1

MJW 12/14/13

TestAmerica Buffalo

Client Sample ID: OC-PZ-16RRSW

Lab Sample ID: 480-50672-3
Matrix: Surface Water

Date Collected: 11/21/13 13:35
Date Received: 11/22/13 01:30

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	41		5.0	1.0	ug/L		11/22/13 09:30	12/05/13 16:29	1
Aluminum	190	J	200	60	ug/L		11/22/13 09:30	12/05/13 16:29	1
Sodium	230000	B	1000	320	ug/L		11/22/13 09:30	12/05/13 16:29	1

Method: 6010 - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	28		5.0	1.0	ug/L		11/22/13 09:30	12/01/13 01:23	1
Aluminum	120	J	200	60	ug/L		11/22/13 09:30	12/01/13 01:23	1
Sodium	230000		1000	320	ug/L		11/22/13 09:30	12/01/13 01:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	250		10	5.6	mg/L			11/25/13 22:36	20
Sulfate	800		40	7.0	mg/L			11/25/13 22:36	20
Ammonia	120		5.0	2.3	mg/L			11/22/13 15:22	250
Nitrate as N	0.87		0.050	0.020	mg/L			11/22/13 07:25	1
Nitrite as N	ND		0.050	0.020	mg/L			11/22/13 07:25	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	2600		1.0	1.0	umhos/cm			11/22/13 10:40	1

Client Sample ID: OC-PZ-17RRSW

Lab Sample ID: 480-50672-4
Matrix: Surface Water

Date Collected: 11/21/13 13:55
Date Received: 11/22/13 01:30

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	640		5.0	1.0	ug/L		11/22/13 09:30	12/05/13 16:32	1
Aluminum	2900		200	60	ug/L		11/22/13 09:30	12/05/13 16:32	1
Sodium	250000	B	1000	320	ug/L		11/22/13 09:30	12/05/13 16:32	1

Method: 6010 - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	440		5.0	1.0	ug/L		11/22/13 09:30	12/01/13 01:26	1
Aluminum	1700		200	60	ug/L		11/22/13 09:30	12/01/13 01:26	1
Sodium	260000		1000	320	ug/L		11/22/13 09:30	12/01/13 01:26	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	300		10	5.6	mg/L			11/25/13 23:06	20
Sulfate	900		40	7.0	mg/L			11/25/13 23:06	20
Ammonia	140		5.0	2.3	mg/L			11/22/13 15:23	250
Nitrate as N	0.71		0.050	0.020	mg/L			11/22/13 07:26	1
Nitrite as N	ND		0.050	0.020	mg/L			11/22/13 07:26	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	2800		1.0	1.0	umhos/cm			11/22/13 10:40	1

mj 1/14/14

Client Sample ID: OC-SD-17

Lab Sample ID: 480-50672-5

Date Collected: 11/21/13 14:00
Matrix: Surface Water
Date Received: 11/22/13 01:30

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	1300		5.0	1.0	ug/L		11/22/13 09:30	12/05/13 16:41	1
Aluminum	6300		200	60	ug/L		11/22/13 09:30	12/05/13 16:41	1
Sodium	260000	B	1000	320	ug/L		11/22/13 09:30	12/05/13 16:41	1

Method: 6010 - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	590		5.0	1.0	ug/L		11/22/13 09:30	12/01/13 01:29	1
Aluminum	2500		200	60	ug/L		11/22/13 09:30	12/01/13 01:29	1
Sodium	260000		1000	320	ug/L		11/22/13 09:30	12/01/13 01:29	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	300		10	5.6	mg/L			11/25/13 23:16	20
Sulfate	900		40	7.0	mg/L			11/25/13 23:16	20
Ammonia	130		5.0	2.3	mg/L			11/22/13 15:24	250
Nitrate as N	0.63		0.050	0.020	mg/L			11/22/13 07:27	1
Nitrite as N	ND		0.050	0.020	mg/L			11/22/13 07:27	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	2800		1.0	1.0	umhos/cm			11/22/13 10:40	1

Client Sample ID: OC-PZ-18RSW

Lab Sample ID: 480-50672-6

Date Collected: 11/21/13 14:10
Matrix: Surface Water
Date Received: 11/22/13 01:30

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	12		5.0	1.0	ug/L		11/22/13 09:30	12/05/13 16:44	1
Aluminum	140	J	200	60	ug/L		11/22/13 09:30	12/05/13 16:44	1
Sodium	65000	B	1000	320	ug/L		11/22/13 09:30	12/05/13 16:44	1

Method: 6010 - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	6.1		5.0	1.0	ug/L		11/22/13 09:30	12/01/13 01:31	1
Aluminum	66	J	200	60	ug/L		11/22/13 09:30	12/01/13 01:31	1
Sodium	66000		1000	320	ug/L		11/22/13 09:30	12/01/13 01:31	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	110		1.0	0.56	mg/L			11/25/13 23:26	2
Sulfate	72		2.0	0.35	mg/L			11/23/13 00:17	1
Ammonia	18	J	1.0	0.45	mg/L			11/22/13 14:47	50
Nitrate as N	0.16		0.050	0.020	mg/L			11/22/13 07:31	1
Nitrite as N	ND		0.050	0.020	mg/L			11/22/13 07:31	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	610		1.0	1.0	umhos/cm			11/22/13 10:40	1

MJW 1/17/14

Client Sample ID: OC-ISCO1

Lab Sample ID: 480-50672-7

Date Collected: 11/21/13 14:30
Matrix: Surface Water
Date Received: 11/22/13 01:30

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	12		5.0	1.0	ug/L		11/22/13 09:30	12/05/13 16:56	1
Aluminum	120	J	200	60	ug/L		11/22/13 09:30	12/05/13 16:56	1
Sodium	64000	B	1000	320	ug/L		11/22/13 09:30	12/05/13 16:56	1

Method: 6010 - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	7.3		5.0	1.0	ug/L		11/22/13 09:30	12/01/13 01:53	1
Aluminum	69	J	200	60	ug/L		11/22/13 09:30	12/01/13 01:53	1
Sodium	66000		1000	320	ug/L		11/22/13 09:30	12/01/13 01:53	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	110		2.5	1.4	mg/L			11/25/13 23:57	5
Sulfate	74		2.0	0.35	mg/L			11/23/13 01:28	1
Ammonia	20		1.0	0.45	mg/L			11/22/13 14:50	50
Nitrate as N	0.16		0.050	0.020	mg/L			11/22/13 07:30	1
Nitrite as N	ND		0.050	0.020	mg/L			11/22/13 07:30	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	600		1.0	1.0	umhos/cm			11/22/13 10:40	1

Client Sample ID: OC-PZ-18RSWDUP

Lab Sample ID: 480-50672-8

Date Collected: 11/21/13 14:10
Matrix: Surface Water
Date Received: 11/22/13 01:30

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	12		5.0	1.0	ug/L		11/22/13 09:30	12/05/13 16:58	1
Aluminum	100	J	200	60	ug/L		11/22/13 09:30	12/05/13 16:58	1
Sodium	63000	B	1000	320	ug/L		11/22/13 09:30	12/05/13 16:58	1

Method: 6010 - Metals (ICP) - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	6.5		5.0	1.0	ug/L		11/22/13 09:30	12/01/13 01:55	1
Aluminum	ND		200	60	ug/L		11/22/13 09:30	12/01/13 01:55	1
Sodium	66000		1000	320	ug/L		11/22/13 09:30	12/01/13 01:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	110		2.5	1.4	mg/L			11/26/13 00:07	5
Sulfate	73		2.0	0.35	mg/L			11/23/13 01:38	1
Ammonia	19	J	1.0	0.45	mg/L			11/22/13 14:51	50
Nitrate as N	0.17		0.050	0.020	mg/L			11/22/13 07:35	1
Nitrite as N	ND		0.050	0.020	mg/L			11/22/13 07:35	1

Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
Specific Conductance	600		1.0	1.0	umhos/cm			11/22/13 10:40	1

MSW 1/13/14

Client Sample Results

Client: Olin Corporation
Project/Site: Olin Annual Sediment

TestAmerica Job ID: 480-50673-1

Client Sample ID: OC-SD-SD1

Lab Sample ID: 480-50673-1
Date Collected: 11/21/13 10:45
Matrix: Solid
Date Received: 11/22/13 01:30
Percent Solids: 70.6

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	24		0.78	0.31	mg/Kg	☼	11/27/13 15:15	11/30/13 19:23	1
Aluminum	9800	J	16	6.8	mg/Kg	☼	11/27/13 15:15	11/30/13 19:23	1
Iron	12000	B	16	1.7	mg/Kg	☼	11/27/13 15:15	11/30/13 19:23	1

Client Sample ID: OC-SD-SD2

Lab Sample ID: 480-50673-2
Date Collected: 11/21/13 12:05
Matrix: Solid
Date Received: 11/22/13 01:30
Percent Solids: 78.8

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	94		0.66	0.26	mg/Kg	☼	11/27/13 15:15	11/30/13 19:44	1
Aluminum	9700		13	5.8	mg/Kg	☼	11/27/13 15:15	11/30/13 19:44	1
Iron	12000	B	13	1.5	mg/Kg	☼	11/27/13 15:15	11/30/13 19:44	1

Client Sample ID: OC-SD-SD3

Lab Sample ID: 480-50673-3
Date Collected: 11/21/13 11:55
Matrix: Solid
Date Received: 11/22/13 01:30
Percent Solids: 76.0

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	29		0.67	0.27	mg/Kg	☼	11/27/13 15:15	11/30/13 19:47	1
Aluminum	11000		13	5.9	mg/Kg	☼	11/27/13 15:15	11/30/13 19:47	1
Iron	17000	B	13	1.5	mg/Kg	☼	11/27/13 15:15	11/30/13 19:47	1

Client Sample ID: OC-SD-SD4

Lab Sample ID: 480-50673-4
Date Collected: 11/21/13 11:40
Matrix: Solid
Date Received: 11/22/13 01:30
Percent Solids: 75.0

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	15		0.61	0.24	mg/Kg	☼	11/27/13 15:15	11/30/13 19:49	1
Aluminum	7300		12	5.4	mg/Kg	☼	11/27/13 15:15	11/30/13 19:49	1
Iron	9300	B	12	1.3	mg/Kg	☼	11/27/13 15:15	11/30/13 19:49	1

Client Sample ID: OC-SD-SD5

Lab Sample ID: 480-50673-5
Date Collected: 11/21/13 11:30
Matrix: Solid
Date Received: 11/22/13 01:30
Percent Solids: 73.5

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	99		0.74	0.29	mg/Kg	☼	11/27/13 15:15	11/30/13 19:52	1
Aluminum	8600		15	6.5	mg/Kg	☼	11/27/13 15:15	11/30/13 19:52	1
Iron	11000	B	15	1.6	mg/Kg	☼	11/27/13 15:15	11/30/13 19:52	1

MJW
1/14/14

TestAmerica Buffalo

Client: Olin Corporation
Project/Site: Olin Annual Sediment

TestAmerica Job ID: 480-50673-1

Client Sample ID: OC-SD-DUP
Date Collected: 11/21/13 00:00
Date Received: 11/22/13 01:30

Lab Sample ID: 480-50673-6
Matrix: Solid
Percent Solids: 70.8

Method: 6010 - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	18		0.66	0.26	mg/Kg	☼	11/27/13 15:15	11/30/13 19:55	1
Aluminum	9600	J	13	5.8	mg/Kg	☼	11/27/13 15:15	11/30/13 19:55	1
Iron	11000	B	13	1.5	mg/Kg	☼	11/27/13 15:15	11/30/13 19:55	1

MSW 1/14/14

TestAmerica Buffalo

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

Reviewer/Date Mike Washburn
Sr. Review/Date Chris Ricardi 1/17/14
Lab Report # 480-50672-1
Project # 6107140016.001.10

Surface Water

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the*

Certification Statement.

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original COC.*

ACTION: If no, contact lab for submission of copy of completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form present?*): **Yes [✓]** No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ sample condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage? **Yes [✓]** No [ ] N/A [ ] Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No [✓]** N/A [ ] Comments:

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* **Yes [✓]** No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* NA ☑ % moisture or solids ☐ *Reporting limits*
NA ☑ *Clean-up method* ☐ Analysis method ☐ *Preparation method* ☐ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? **Yes [✓]** No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☐ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information. Sel LCSD

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? **Yes [✓]** No [ ] N/A [ ] Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP **Yes [ ]** No [✓] N/A [ ] Comments:

NOTE: *Verify that the reported metals match the target list specified on the COC.* Aluminum RL is 200 ug/L vice 100 ug/L

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following: Yes [✓] **No** [ ] N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

Sodium - 546 ug/L
5X = 2730 ug/L

If the sample concentration is > 5 × blank value, no qualification is needed.

All Results > 5x action limit. No action req.

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*
ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	***MADEP % Rec***
Water	*80-120*
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is <30%, positive and non-detect results are rejected (R).

Comments:

6.0 Matrix Spikes

GC-PZ-18R SW

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked.

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source MS/MSD is required by MADEP.*
ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	***MADEP % Rec***	QAPP % Rec	Method
Water	*75-125*	N/A	6010B
Water	*N/A*	70-130	200.7
Soil	*75-125*	75-125	6010B

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result, SR = Sample result, SA = Spike added

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result, D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes [ ]** No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No [ ]** N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

NOTE: *MADEP does not require the collection of rinsate blanks.*

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [✓] **No** [ ] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes [✓]** No [ ] N/A [ ] Comments:

SOW ☐ QAPP *(1 per 10)* ☑ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes [✓] **No [ ]** N/A [ ] Comments:

ACTION: If results for both total and dissolved are ≥ 5x the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

Sodium dissolved > total
results ≥ 5x PQL
dissolved concentration < 10% higher than total

10.0 Application of Validation Qualifiers

Was any of the data qualified?

Yes [ ] **No [✓]** N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

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MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

Method: 6010 - Metals (ICP)

Lab Sample ID: MB 480-153835/1-A
Matrix: Water
Analysis Batch: 156066

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 153835

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND		5.0	1.0	ug/L		11/22/13 09:30	12/05/13 16:17	1
Aluminum	ND		200	60	ug/L		11/22/13 09:30	12/05/13 16:17	1
Sodium	546	J	1000	320	ug/L		11/22/13 09:30	12/05/13 16:17	1

Lab Sample ID: LCS 480-153835/2-A
Matrix: Water
Analysis Batch: 156066

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 153835

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	200	217		ug/L		108	80 - 120
Aluminum	10000	10800		ug/L		108	80 - 120
Sodium	10000	10700		ug/L		107	80 - 120

Lab Sample ID: LCSD 480-153835/3-A
Matrix: Water
Analysis Batch: 156066

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 153835

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chromium	200	219		ug/L		109	80 - 120	1	20
Aluminum	10000	11000		ug/L		110	80 - 120	1	20
Sodium	10000	10700		ug/L		107	80 - 120	0	20

Lab Sample ID: 480-50672-6 MS
Matrix: Surface Water
Analysis Batch: 156066

Client Sample ID: OC-PZ-18RSW-MS
Prep Type: Total/NA
Prep Batch: 153835

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	12		200	233		ug/L		110	75 - 125
Aluminum	140	J	10000	11100		ug/L		109	75 - 125
Sodium	65000	B	10000	75100	4	ug/L		97	75 - 125

Lab Sample ID: 480-50672-6 MSD
Matrix: Surface Water
Analysis Batch: 156066

Client Sample ID: OC-PZ-18RSW-MSD
Prep Type: Total/NA
Prep Batch: 153835

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chromium	12		200	229		ug/L		109	75 - 125	1	20
Aluminum	140	J	10000	11200		ug/L		110	75 - 125	1	20
Sodium	65000	B	10000	75900	4	ug/L		105	75 - 125	1	20

Lab Sample ID: MB 480-153569/29-B
Matrix: Water
Analysis Batch: 155183

Client Sample ID: Method Blank
Prep Type: Dissolved
Prep Batch: 153834

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND		5.0	1.0	ug/L		11/22/13 09:30	12/01/13 01:10	1
Aluminum	ND		200	60	ug/L		11/22/13 09:30	12/01/13 01:10	1
Sodium	ND		1000	320	ug/L		11/22/13 09:30	12/01/13 01:10	1

Field Dups

fraction	lab_sample_id	field_sample_id	qc_code	param_name	final_result	final_qualifier	Difference	Average	RPD
T	480-50672-6	OC-PZ-18RSW	FS	Chromium	12		0	12	0%
T	480-50672-8	OC-PZ-18RSWDUP	FD	Chromium	12				
T	480-50672-6	OC-PZ-18RSW	FS	Sodium	65000	B	2000	64000	3%
T	480-50672-8	OC-PZ-18RSWDUP	FD	Sodium	63000	B			
D	480-50672-6	OC-PZ-18RSW	FS	Chromium	6.1		0.4	6.3	6%
D	480-50672-8	OC-PZ-18RSWDUP	FD	Chromium	6.5				
D	480-50672-6	OC-PZ-18RSW	FS	Sodium	66000		0	66000	0%
D	480-50672-8	OC-PZ-18RSWDUP	FD	Sodium	66000				

MJW
1/14/14

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

SED

Reviewer/Date Mike Washburn 1/14/14
Sr. Review/Date Chris Ricardi 1/17/14
Lab Report # 480-50673-1
Project # 6107140016.001.10

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☐ *Sample identification – Field and Laboratory*
Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the*

Certification Statement.

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: Olin receives and maintains the *original COC.*

ACTION: If no, contact lab for submission of copy of completed *COC.*

1.5 Sample Receipt Information (*Cooler Receipt Form present?*): **Yes [✓]** No [ ] N/A [ ] Comments:

Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory?

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ sample condition observed ☒ NA pH verified (where applicable) ☑ Field and lab IDs cross referenced

→ noted appropriate containers

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were all samples delivered to the laboratory without breakage? **Yes [✓]** No [ ] N/A [ ] Comments:

1.5.2 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? Yes [ ] **No [✓]** N/A [ ] Comments:

1.6 Sample Results Section: *Was each of the following requirements supplied in the laboratory report for each sample?* **Yes [✓]** No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ *Date and time collected* ☑ Analyst Initials ☑ *Dilution Factor* ☑ % moisture or solids ☑ *Reporting limits*
☒ NA *Clean-up method* ☑ Analysis method ☑ *Preparation method* ☑ *Date of preparation/extraction/digestion clean-up and analysis, where applicable*
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was each of the following information supplied in the laboratory report for each sample batch? **Yes [✓]** No [ ] N/A [ ] Comments:

OLIN CORPORATION
LEVEL I DATA QUALITY EVALUATION – OPTION 1
STANDARD OPERATING PROCEDURE AND CHECKLIST
ICP METALS BY METHOD 6010B/200.7

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☒ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information. See LCS D

2.0 Holding Times

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? Holding time for metals is 180 days from sample collection to analysis for both water and soil. Yes [ ] **No [✓]** N/A [ ] Comments:

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded, qualify all positive results (J) and non-detects (UJ). If grossly exceeded (2X holding time) reject (R) all non-detect results.

3.0 Laboratory Method

3.1 Was the correct laboratory method used? **Yes [✓]** No [ ] N/A [ ] Comments:

Water Digestion	3005A or 3010A or 3020A
Soil Digestion	3050B
Metals	6010B or 200.7

ACTION: If no, contact laboratory to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change and to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ SOW ☑ QAPP ☐ Lab ☐ MADEP **Yes [ ]** No [X] N/A [ ] Comments:

NOTE: *Verify that the reported metals match the target list specified on the COC.*

Variation in the reporting limit due to moisture content of the sediment sample

ACTION: If no, evaluate variation with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If dilutions were required, were dilution factors reported? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 Method Blanks

4.1 Is the Method Blank Summary present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, call the laboratory for submission of missing data.

4.2 Frequency of Analysis: Was a method blank analyzed for each digestion batch of < 20 field samples? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact laboratory for justification. Consult senior chemist for action needed. Narrate non-compliance.

4.3 Is the method blank less than the PQLs for all target elements? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *MADEP requires the method blank to be matrix matched and digested with the samples*

4.4 Do any method blanks have positive results for metals? Qualify data according to the following: Yes [✓] **No** [ ] N/A [ ] Comments:

Iron

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

Iron - 3.93 mg/kg

If the sample concentration is > 5 × blank value, no qualification is needed.

5x = 19.65 mg/kg

no action required, all results > action limit

ACTION: For any blank with positive results, list all contaminants for each method blank including the concentration detected and the flagging level (flagging level = 5x the blank value) and the associated samples and qualifiers.

5.0 Laboratory Control Standard

5.1 Was a laboratory control standard run with each analytical batch of 20 samples or less? **Yes** [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source LCS is required by MADEP.*
ACTION: Call laboratory for LCS form submittal. If data are not available, use professional judgement to evaluate data accuracy associated with that batch.

5.2 Is a LCS Summary Form present? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is the recovery of any analyte outside of MADEP control limits? Yes [ ] **No** [✓] N/A [ ] Comments:

Sample Type	***MADEP % Rec***
Water	*80-120*
Soil	within Lab generated limits

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and non-detects results within the batch as (J). If LCS recovery is <30%, positive and non-detect results are rejected (R).

Comments:

6.0 Matrix Spikes

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

OC-SD-SD1

6.1 Were project-specific MS/MSDs collected? List project samples that were spiked.

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form present?

Yes [✓] No [ ] N/A [ ] Comments:

NOTE: *A full target, second source MS/MSD is required by MADEP.*
ACTION: If any matrix spike data are missing, call lab for resubmission.

6.3 Were matrix spikes analyzed as indicated on the COC and project schedule?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data are missing, call lab for resubmission. If none, no qualification is needed. Narrate non-compliance.

6.4 Are any metal spike recoveries outside of the QC limits?

Yes [✓] **No** [ ] N/A [ ] Comments:

Sample Type	***MADEP % Rec***	QAPP % Rec	Method
Water	*75-125*	N/A	6010B
Water	*N/A*	70-130	200.7
Soil	*75-125*	75-125	6010B

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result, SR = Sample result, SA = Spike added

Aluminum - 164/210

estimate Aluminum in Samples OC-SD-SD1 OC-SD-Dup

NOTE: If dilutions are required due to high sample concentrations (> 4X spike), the data are evaluated, but no flags are applied.

NOTE: If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.

ACTION: MS/MSD flags only apply to the sample spiked. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit, qualify positive results and non-detects (J).

6.5 Are any RPDs for MS/MSD recoveries outside of the QC limits? Yes [ ] **No** [✓] N/A [ ] Comments:

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where: S = MS sample result
D = MSD sample result

NOTE: If dilutions are required due to high sample concentrations, the data are evaluated, but no flags are applied.

ACTION: If the RPD exceeds the control limit, qualify positive results and non-detects (J).

7.0 Laboratory Duplicate

7.1 Was a laboratory duplicate sample analyzed? If so, is the Laboratory Duplicate Sample Form present? **Yes** [ ] No [✓] N/A [ ] Comments:

NOTE: *MADEP refers to this sample as a "matrix duplicate".*

ACTION: If not analyzed, qualification is not needed. If data is missing, contact laboratory for resubmission of report. Narrate non-compliance.

7.2 Is the RPD between the result for the laboratory duplicate sample and the result for the parent sample outside of the QA/QC limits? Yes [ ] **No** [ ] N/A [✓] Comments:

MADEP Laboratory Duplicate Sample RPD Criteria:	QAPP RPD
For aqueous results > 5× RL, RPD must be ± 20%	20
For aqueous results < 5× RL, RPD must be ≤ RL	20
For soil/sediment results > 5× RL, RPD must be ± 35%	20
For soil/sediment results < 5× RL, RPD must be ≤ 2× RL	20

ACTION: If the RPD exceeds the limits, qualify both positive results and non-detects as estimated and flag them J. Narrate non-compliance

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes [ ]** No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No [ ]** N/A [✓] Comments:

NOTE: *MADEP does not require the collection of rinsate blanks.*

ACTION: Evaluate rinsate results against blank results to determine if contaminant may be laboratory-derived. If results are not lab-related, qualify according to below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. Yes [✓] **No [ ]** N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes [✓]** No [ ] N/A [ ] Comments:

SOW ☐ QAPP *(1 per 10)* ☑ *MADEP Option 1 (1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 50% for soils or waters? Calculate the RPD for all results and attach to this review. **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: RPD must be ≤50% for soil and water. Qualify data (J) for both sample results if the RPD exceeds 50%.

10.0 Special QA/QC

10.1 Were both total and dissolved metals analysis performed? If so, the dissolved metal concentration should not exceed that of the total metal. Yes [ ] **No [✓]** N/A [ ] Comments:

ACTION: If results for both total and dissolved are ≥ 5x the PQL **and** the dissolved concentration is 10% higher than the total, flag both results as estimated (J). If total and dissolved concentrations are less than 5x the PQL **and** the **difference** exceeds 2x the PQL, flag both results as estimated (J)

10.0 Application of Validation Qualifiers

Was any of the data qualified? Yes [✓] No [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES

LAW, 1999, "Final Quality Assurance Project Plan, Olin Wilmington Property, 51 Eames Street, Wilmington, MA", LAW Engineering and Environmental Services, Kennesaw, GA 30144. August 1999

U.S. Environmental Protection Agency (USEPA), 1989. "Region 1 Laboratory Data Validation Functional Guidelines For Evaluating Inorganic Analyses"; Hazardous Site Evaluation Division; February 1989.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

MADEP, 2010. "Quality Control Requirements and Performance Standards for the Analysis of Trace Metals by Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) in Support of Response Actions under the Massachusetts Contingency Plan (MCP)" WSC-CAM, Final, Revision No. 1, 5 July 2010.

Method: 6010 - Metals (ICP)

Lab Sample ID: MB 480-154525/1-A
Matrix: Solid
Analysis Batch: 155180

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 154525

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND		0.54	0.22	mg/Kg		11/27/13 15:15	11/30/13 19:16	1
Aluminum	ND		11	4.7	mg/Kg		11/27/13 15:15	11/30/13 19:16	1
Iron	3.93	J	11	1.2	mg/Kg		11/27/13 15:15	11/30/13 19:16	1

Lab Sample ID: LCDSRM 480-154525/3-A LCDSRM
Matrix: Solid
Analysis Batch: 155180

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 154525

Analyte	Spike Added	LCDSRM Result	LCDSRM Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chromium	136	137		mg/Kg		100.5	70.4 - 130.1	2	20
Aluminum	8860	8030		mg/Kg		90.7	42.0 - 158.4	3	20
Iron	12600	11200		mg/Kg		88.4	31.0 - 168.3	0	20

Lab Sample ID: LCSSRM 480-154525/2-A
Matrix: Solid
Analysis Batch: 155180

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 154525

Analyte	Spike Added	LCSSRM Result	LCSSRM Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	136	140		mg/Kg		103.1	70.4 - 130.1
Aluminum	8850	7790		mg/Kg		88.1	42.0 - 158.4
Iron	12600	11200		mg/Kg		88.9	31.0 - 168.3

Lab Sample ID: 480-50673-1 MS
Matrix: Solid
Analysis Batch: 155180

Client Sample ID: OC-SD-SD1-MS
Prep Type: Total/NA
Prep Batch: 154525

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Chromium	24		56.9	82.8		mg/Kg	☼	103	75 - 125
Aluminum	9800		2850	14400	F	mg/Kg	☼	164	75 - 125
Iron	12000	B	2850	14600	4	mg/Kg	☼	95	75 - 125

Lab Sample ID: 480-50673-1 MSD
Matrix: Solid
Analysis Batch: 155180

Client Sample ID: OC-SD-SD1-MSD
Prep Type: Total/NA
Prep Batch: 154525

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Chromium	24		54.1	75.7		mg/Kg	☼	96	75 - 125	9	35
Aluminum	9800		2710	15500	F	mg/Kg	☼	210	75 - 125	7	35
Iron	12000	B	2710	16600	4	mg/Kg	☼	172	75 - 125	13	35

4x

MSW 1/14/14

TestAmerica Buffalo

Field Dup

lab_sample_id	field_sample_id	qc_code	param_name	final_result	Difference	Average	RPD
480-50673-1	**OC-SD-SD1**	**FS**	**Aluminum**	**9800**	200	9700	2%
480-50673-6	**OC-SD-DUP**	**FD**	**Aluminum**	**9600**			
480-50673-1	OC-SD-SD1	FS	Chromium	24	6	21	29%
480-50673-6	OC-SD-DUP	FD	Chromium	18			
480-50673-1	**OC-SD-SD1**	**FS**	**Iron**	**12000**	1000	11500	9%
480-50673-6	**OC-SD-DUP**	**FD**	**Iron**	**11000**			

OLIN-WILMINGTON
LEVEL I DATA QUALITY EVALUATION
STANDARD OPERATING PROCEDURE AND CHECKLIST
WET CHEMISTRY PARAMETERS BY VARIOUS METHODS

Reviewer/Date Mike Washburn 1/13/14
Sr. Review/Date Chris Ricaurte 1/17/14
Lab Report # 480-50672-1
Project # 6107140016.09.10

Note: The following analyses will be evaluated according to the "MADEP QA/QC Guidelines for **Sampling, Data Evaluation and Reporting Activities.**" MADEP, however, may not list QA/QC criteria for every chemical analysis. Where not defined by MADEP, criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements will default to limits employed by the laboratory.

1.0 Laboratory Deliverable Requirements

1.1 Laboratory Information: Was all of the following provided in the laboratory report? **Yes** [✓] No [ ] N/A [ ] Comments:
Check items received.

☑ *Name of Laboratory* ☑ *Address* ☑ *Project ID* ☑ *Phone #* ☑ *Sample identification – Field and Laboratory*

Client Information: ☑ *Name* ☑ *Address* ☑ *Client Contact* *(IDs must be cross-referenced)*

ACTION: If no, contact lab for submission of missing or illegible information.

1.2 Laboratory Report Certification Statement ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

Does the laboratory report include a completed Analytical Report Certification in the required format?

***ACTION**: If no, contact lab for submission of missing certification or certification with correct format.*

1.3 Laboratory Case Narrative: ***Yes*** [✓] *No* [ ] *N/A* [ ] *Comments:*

☑ *Narrative serves as an exception report for the project and method QA/QC performance.* ☑ *Narrative includes an explanation of each discrepancy on the Certification Statement.*

***ACTION**: If no, contact lab for submission of missing or illegible information.*

1.4 Chain of Custody (COC) copy present with all documentation completed? **Yes** [✓] No [ ] N/A [ ] Comments:

Does the laboratory report include copies of Chain of Custody forms containing all samples in this SDG?

NOTE: Olin receives and maintains the *original* COC.

ACTION: If no, contact lab for submission of copy of missing completed COC.

1.5 Sample Receipt Information (*Cooler Receipt Form*): Were each of the following tasks completed and recorded upon receipt of the sample(s) into the laboratory? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Sample temperature confirmed: must be 1° – 10° C. (If samples were sent by courier and delivered on the same day as collection, temperature requirement does not apply).

☑ Container type noted ☑ Condition observed ☑ pH verified (where applicable) ☑ Field and lab IDs cross referenced

ACTION: If no, contact lab for submission of missing or incomplete documentation.

1.5.1 Were the correct bottles and preservatives used?

Yes [✓] No [ ] N/A [ ] Comments:

check sheet stated appropriate sample containers were used.

Ammonia,– 1 Liter polyethylene/H_2SO_4 to pH<2,cool to 4°C

Oil & Grease – 1 Liter glass/HCL or H2SO4 to pH<2,cool to 4°C

Alkalinity – 1 Liter polyethylene/cool to 4°C

Chemical Oxygen Demand – 50 mL polyethylene/H_2SO_4 to pH<2,cool to 4°C

Chloride, pH, sulfate, nitrate, nitrite - 50 mL polyethylene/cool to 4°C

Nitrate/nitrite - H2SO4 to pH<2,cool to 4°C

Organic Carbon – 500 mL amber glass bottle/HCl or H_2SO_4 to pH<2,cool to 4°C

Sulfide – 50 mL polyethylene/ZnAcetate + NaOH to pH>9, cool to 4°C

Phenolics - H_2SO_4 to pH<2,cool to 4°C

Specific conductance, TDS, TSS – 100 mL polyethylene/cool to 4°C

ACTION: If no, inform senior chemist. Document justification for change in container/volume (if applicable), qualify positive and non-detect data (J) data if cooler temperature exceeds 10°C. Rejection of data requires professional judgment

1.5.2 Were all samples delivered to the laboratory without breakage?

Yes [✓] No [ ] N/A [ ] Comments:

1.5.3 Does the *Cooler Receipt Form* or Lab Narrative indicate other problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

Yes [ ] **No [✓]** N/A [ ] Comments:

1.6 Sample Results Section: *Was the following information supplied in the laboratory report for each sample?*

Yes [✓] No [ ] N/A [ ] Comments:

☑ Field ID and Lab ID ☑ Date and time collected ☑ Analyst Initials ☑ Dilution Factor N/A ☐ % moisture or solids ☑ Reporting limits
N/A ☐ *Clean-up method* ☑ Analysis method ☑ Preparation method ☑ Date of preparation/extraction/digestion clean-up and analysis, where applicable
☑ Matrix ☑ Target analytes and concentrations ☑ Units (soils must be reported in dry weight)

ACTION: If no, contact lab for submission of missing or incomplete information.

1.7 QA/QC Information: Was the following information provided in the laboratory report for each sample batch? **Yes** [✓] No [ ] N/A [ ] Comments:

☑ Method blank results ☑ LCS recoveries ☑ MS/MSD recoveries and RPDs ☑ Laboratory duplicate results (where applicable)

ACTION: If no, contact lab for submission of missing or incomplete information.

2.0 Holding Times Yes [ ] **No** [✓] N/A [ ] Comments:

Have any technical holding times, determined from date of collection to date of analysis, been exceeded? The holding times are as follows:

28 days = ammonia, chemical oxygen demand, chloride, organic carbon, oil & grease, specific conductance, total organic carbon and sulfate

Alkalinity = 14 days | Sulfide, TDS, TSS = 7 days | pH = analyze immediately | Nitrate nitrogen as N = 48 hrs

Nitrite nitrogen as N = 48 hrs | Nitrate + Nitrite as N = 28 days

NOTE: List samples that exceed hold time with # of days exceeded on checklist

ACTION: If technical holding times are exceeded qualify results (J). For water samples that are grossly exceeded (>2X hold time) reject (R) all non-detect results. Professional judgment used to qualify soils.

3.0 Laboratory Method **Yes** [✓] No [ ] N/A [ ] Comments:

3.1 Was the correct laboratory method used?

ACTION: If no, contact lab to provide justification for method change compared to the requested method. Contact senior chemist to inform Client of change or to request variance.

3.2 Are the practical quantitation limits the same as those specified by the ☐ QAPP/IRSWP ☐ Lab? **Yes** [ ] No [✓] N/A [ ] Comments:

Nitrite is 0.05 vice 0.01

Note: *The MADEP QA/QC Guidelines do not yet list PQLs for wet chemistry analyses,*

therefore all criteria will default to values stipulated in the QAPP. Where the QAPP does not define criteria, QA/QC requirements default to limits employed by the lab**. Other criteria may also apply.*

Ammonia* ☑ = 0.1 mg/ L	Alkalinity** ☐ = 1 mg/L	Bicarbonate Alkalinity** ☐ = 1 mg/L	Carbonate Alkalinity** ☐ = 1 mg/L
Nitrate Nitrogen as N* ☑ = .05 mg/L	Nitrite Nitrogen as N* ☑ = .01 mg/L	Chloride* ☑ = 1 mg/L	Hardness * ☐ = 2 mg/L
Spec. Cond.** ☑ 3 umhos/cm	Total Organic Carbon** ☐ = 1 mg/L	Oil & Grease* ☐ = 5.5 mg/L	Sulfate (EPA 300.0)* ☑ = 2 mg/L
COD:* Low – 20 mg/L	COD* High - 50 mg/L ☐	TDS* ☐ = 10 mg/L	TSS* ☐ = 5 mg/L
pH* ☐ < 2 to > 12	Phenolic - 0.01 mg/L		

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

Other parameter(list) _____ PQL = _____ ☐ Source of PQL = _____

ACTION: If no, evaluate change with respect to sample matrix, preparation, dilution, moisture, etc. If sample PQL is indeterminate, contact lab for explanation.

3.3 Are the appropriate parameter results present for each sample in the SDG? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, check Request for Analysis to verify if method was ordered and COC to verify that it was sent, and contact lab for resubmission of the missing data

3.4 If *dilutions were required, were dilution factors reported?* **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, contact the lab for submission.

4.0 <u>Method Blanks</u> **Yes** [✓] No [ ] N/A [ ] Comments:

4.1 Are the Method Blank Summaries present?

ACTION: If no, call the laboratory for submission of missing data.

4.2 Was a method blank analyzed for each analysis batch of wet chemistry field samples of 20 or less? **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION: If no, document discrepancy in case narrative and contact lab for justification. Consult senior chemist for action needed.

4.3 Is the method blank less than the PQL? (See Section 3.2 for PQLs). **Yes [✓]** No [ ] N/A [ ] Comments:

4.4 Do any method blanks have positive results for wet chemistry parameters? Qualify data according to the following: Yes [ ] **No [✓]** N/A [ ] Comments:

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

ACTION: If any blank has positive results, list all the concentrations detected and flagging level (flagging level = 5 × blank value) on the checklist. List all affected samples and their qualifiers.

5.0 Laboratory Control Standards

5.1 Was a laboratory control standard (LCS) run with each analytical batch of 20 samples or less? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, call laboratory for LCS form submittal. If data is not available, use professional judgment to determine qualification actions for data associated with the batch.

5.2 Is a LCS Summary Form present? **Yes [✓]** No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

5.3 Is any wet chemistry analyte LCS recovery outside the control limits? Yes [ ] **No [✓]** N/A [ ] Comments:

LCS Limits:

Alkalinity** ☐ = 80-120%	Bicarbonate Alkalinity** ☐ = 80-120%	Carbonate Alkalinity** ☐ = 80-120%	Specific Conductivity *☐ = 80-120%
Total Organic Carbon** ☐ = 80-120%	TDS** ☐ = 80-120%	Oil & Grease* ☐ = 80-120%	Ammonia Nitrogen as N* ☑ = 80-120%
COD Low* ☐ = 80-120%	COD High* ☐ = 80-120%	Nitrate Nitrogen as N** ☑ = 80-120%	Nitrite Nitrogen as N** ☑ = 80-120%
Hardness* ☐ = 80-120%	Chloride* ☑ = 80-120%	Sulfate (EPA 300.0)* ☑ = 80-120%	pH* ☐ = 98-102% TSS* NA

Other parameter(list) _____ %R = _____ ☐ Rec Limits= _____

Other parameter(list) _____ %R = _____ ☐ Rec Limits = _____

(MADEP has not yet defined LCS recovery limits for wet chemistry analyses.)

ACTION: If recovery is above the upper limit, qualify all positive sample results within the batch as (J). If recovery is below the lower limit, qualify all positive and no-detect results within the batch as (J). If LCS recovery is <10%, non-detect results are rejected (R).

6.0 Matrix Spikes

OC-PZ-18RSW-MS
OC-PZ-18RSW-MSD

Matrix spikes may be collected at different frequencies based on monthly, quarterly, or task specific schedules. Confirm spike requirements for each set with the senior chemist.

6.1 Were project-specific MS/MSDs analyzed? List project samples that were spiked.

Yes [☑] No [ ] N/A [ ] Comments:

ACTION: If no, contact senior chemist to see if any were specified.

6.2 Is the MS/MSD Recovery Form present?

Yes [☑] No [ ] N/A [ ] Comments:

ACTION: If no, contact lab for resubmission of missing data.

6.3 Were matrix spikes analyzed at the required frequency of 1 per 20 samples per matrix?

Yes [☑] No [ ] N/A [ ] Comments:

ACTION: If any matrix spike data is missing, call lab for resubmission.

6.4 Are any wet chemistry analyte spike recoveries outside of the QC limits?

Yes [☑] **No [ ]** N/A [ ] Comments:

ammonia - 136/139 qualified
OC-PZ-18RSW and OC-PZ-18RSWDUP
estimated "J".

NOTE: $\%R = \frac{(SSR-SR)}{SA} \times 100\%$ Where: SSR = Spiked sample result; SR = Sample result; SA = Spike added

MS/MSD Recovery Limits:

Alkalinity* = NA	Bicarbonate Alkalinity* = NA	Carbonate alkalinity* = NA	Ammonia* (~~LACHAT~~) 350.1 ☑ = 75-125%
Chloride* (~~SM 4500 Cl~~) 300.0 ☑ = 75-125%	Specific Conductivity * = NA	Total Organic Carbon* = NA	TDS** = NA
Oil & Grease* = NA	COD Low* ☐ = 75-125%	COD High* ☐ = 75-125%	Nitrate Nitrogen as N** ☑ = 75-125%
Nitrite Nitrogen as N** ☑ = 75-125%	Hardness* ☐ = 75-125%	Sulfate (EPA 300.0)* ☑ = 75-125%	pH* = NA TSS* = NA

Other parameter(list) _____ % R = _____ ☐ Rec Limits = _____

* = Laboratory Limits ** = Olin QAPP Limits (*MADEP has not yet defined LCS recovery limits for wet chemistry analyses.*)

NOTES: 1) If only one of the recoveries for an MS/MSD pair is outside of the control limits, no qualification is necessary. Use professional judgment for the MS/MSD flags.
2) If the MS/MSD was performed by the laboratory on a non-project sample, no qualification is required.

ACTION: MS/MSD flags only apply to the sample spiked. Do not evaluate if sample concentration is > 4X spike. If the recoveries of the MS and MSD exceed the upper control limit, qualify positive results as estimated (J). If the recoveries of the MS and MSD are lower than the lower control limit but > 30%, qualify both positive results and non-detects (J). If the MS/MSD recovery is < 30% and the sample is non-detect, the results are considered unusable and flagged (R).

ACTION: Laboratory control limits apply when spiked sample results fall within the normal calibration range. If dilutions are required due to high sample concentrations, the data is evaluated, but no flags are applied.

6.5 Are any RPDs for MS/MSD recoveries outside of the QA/QC limits?

NOTE: $RPD = \frac{S-D}{(S+D)/2} \times 100\%$ Where S = MS result, D = MSD result

Yes [ ] **No [✓]** N/A [ ] Comments:

MS/MSD RPD Limits:

RPD ≤ 20

7.0 Laboratory Duplicate

Are the RPDs for the laboratory duplicates <20% unless otherwise specified below?

Yes [✓] No [ ] N/A [ ] Comments:

ACTION: If the RPD is greater than specified limits, qualify all results for that analyte as estimated (J).

pH* ☐ = 3% Specific Conductivity *☑ = 5% TSS** ☐ = 6% TDS** ☐ = 6%

8.0 Sampling Accuracy

The majority of ground water samples are collected directly from a tap, process stream, or with dedicated tubing. Rinse blanks will not be collected.

8.1 Were rinsate blanks collected? Prior to evaluating rinsate blanks, obtain a list of the associated samples from the senior chemist. **Yes** [ ] No [✓] N/A [ ] Comments:

8.2 Do any rinsate blanks have positive results? Yes [ ] **No** [ ] N/A [✓] Comments:

ACTION: Evaluate rinsate results vs. blank results to determine if contaminant may be laboratory-derived. If not lab-related, qualify according to the table below.

If the sample concentration is < 5 × blank value, flag sample result non-detect "U" at the PQL or the concentration reported if greater than the PQL.

If the sample concentration is > 5 × blank value, no qualification is needed.

NOTE: *MADEP does not require the collection of rinsate blanks.*

9.0 Field Duplicates

9.1 Were field duplicate samples collected? Obtain a list of samples and their associated field duplicates. **Yes** [✓] No [ ] N/A [ ] Comments:

9.2 Were field duplicates collected per the required frequency? **Yes** [✓] No [ ] N/A [ ] Comments:

QAPP/IRSWP ☐ *MADEP Option 1(1 per 20)* ☐ *MADEP Option 3 (1 per 10)* ☐

9.3 Was the RPD ≤ 30% for waters ≤ 50% for soils? Calculate the RPD for results and attach to this review. **Yes** [✓] No [ ] N/A [ ] Comments:

ACTION:. Qualify data (J) for both sample results if the RPD exceeded.

Was any of the data qualified? Yes [✓] **No** [ ] N/A [ ] Comments:

If so, apply data qualifiers directly to the DQE copy of laboratory report and **flag pages** for entry in database.

REFERENCES:-

MACTEC, 2007. "Draft Interim Response Steps Work Plan"; Olin Chemical Superfund Site, 51 Eames Street, Wilmington, Massachusetts.; Project No. 6300-06-0010/41.1; July 25, 2007.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Compendium of Quality Control Requirements and Performance Standards for Selected Analytical Protocols ," WSC-CAM #10-320, Final, Revision No. 1, 5 July 2010.

MADEP, 2010. Massachusetts Department of Environmental Protection Bureau of Waste Site Cleanup, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data in Support of Action Conducted Under the Massachusetts Contingency Plan (MCP)," WSC-CAM, Section VIIA, Final, Revision No. 1, 1 July 2010.

field_sample_id	qc_code	param_name	final_result	Diff	Aver	RPD
OC-PZ-18RSW	FS	Chloride	110	0	110	0%
OC-PZ-18RSWDUP	FD	Chloride	110			
OC-PZ-18RSW	FS	LAB SPECIFIC CONDUCTANCE	610	10	610	2%
OC-PZ-18RSWDUP	FD	LAB SPECIFIC CONDUCTANCE	600			
OC-PZ-18RSW	FS	Nitrate as N	0.16	0.01	0.16	6%
OC-PZ-18RSWDUP	FD	Nitrate as N	0.17			
OC-PZ-18RSW	FS	Nitrogen, as Ammonia	18	1	18	6%
OC-PZ-18RSWDUP	FD	Nitrogen, as Ammonia	19			
OC-PZ-18RSW	FS	Sulfate	72	1	72	1%
OC-PZ-18RSWDUP	FD	Sulfate	73			

MJW
1/13/14

Method: 350.1 - Nitrogen, Ammonia (Continued)

Lab Sample ID: LCS 480-154006/196
Matrix: Water
Analysis Batch: 154006

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia	1.00	0.997		mg/L		100	90 - 110

Lab Sample ID: LCS 480-154006/220
Matrix: Water
Analysis Batch: 154006

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia	1.00	0.992		mg/L		99	90 - 110

Lab Sample ID: 480-50672-6 MS
Matrix: Surface Water
Analysis Batch: 154006

Client Sample ID: OC-PZ-18RSW-MS
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Ammonia	18		10.0	31.8	F	mg/L		136	90 - 110

Lab Sample ID: 480-50672-6 MSD
Matrix: Surface Water
Analysis Batch: 154006

Client Sample ID: OC-PZ-18RSW-MSD
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Ammonia	18		10.0	32.1	F	mg/L		139	90 - 110	1	20

Method: 353.2 - Nitrogen, Nitrite

Lab Sample ID: MB 480-153833/3
Matrix: Water
Analysis Batch: 153833

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nitrite as N	ND		0.050	0.020	mg/L			11/22/13 07:17	1

Lab Sample ID: LCS 480-153833/4
Matrix: Water
Analysis Batch: 153833

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrite as N	1.50	1.49		mg/L		99	90 - 110

Lab Sample ID: 480-50672-6 MS
Matrix: Surface Water
Analysis Batch: 153833

Client Sample ID: OC-PZ-18RSW-MS
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Nitrite as N	ND		1.00	1.00		mg/L		100	90 - 110

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